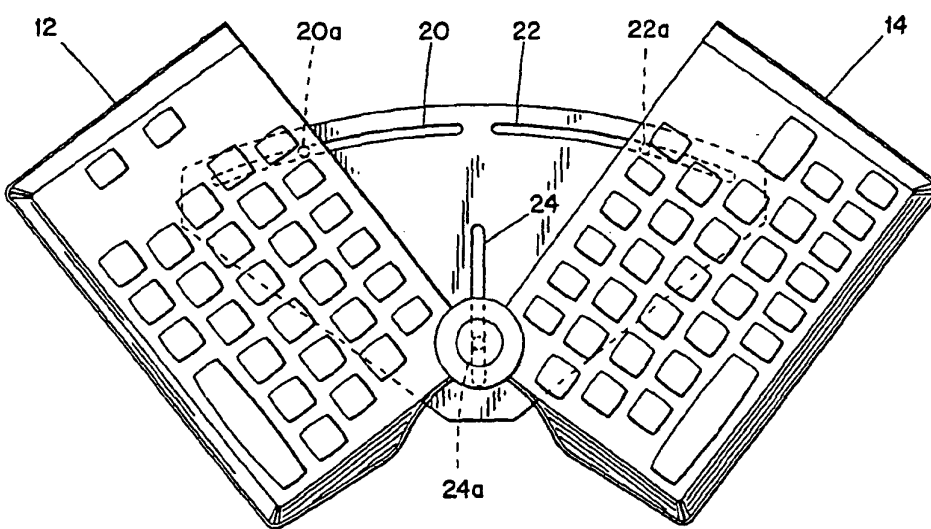


PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 3/02		A1	(11) International Publication Number: WO 98/43157
			(43) International Publication Date: 1 October 1998 (01.10.98)
<p>(21) International Application Number: PCT/US98/05389</p> <p>(22) International Filing Date: 23 March 1998 (23.03.98)</p> <p>(30) Priority Data: 08/826,797 25 March 1997 (25.03.97) US</p> <p>(71) Applicant: ERICSSON INC. [US/US]; 7001 Development Drive, P.O. Box 13969, Research Triangle Park, NC 27709 (US).</p> <p>(72) Inventor: KUROKAWA, Haruo; 600-J Golden Horseshoe Circle, Morrisville, NC 27560 (US).</p> <p>(74) Agents: GRUDZIECKI, Ronald, L. et al.; Burns, Doane, Swecker & Mathis, L.L.P., P.O. Box 1404, Alexandria, VA 22313-1404 (US).</p>			<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>
<p>(54) Title: SPLIT KEYBOARD</p> 			
<p>(57) Abstract</p> <p>A split keyboard in which multiple keyboard elements are adjustably attached to each other to improve user comfort and allow storage in a relatively confined area. The keyboard elements are slidably attached at one or more connection points to a slotted base plate to provide adequate stability and durability. Retaining means can be provided to retain the keyboard elements in one or more desired positions.</p>			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Larvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

SPLIT KEYBOARD

Field of the Invention

The present invention relates generally to keyboards. More particularly, the present invention relates to split keyboards which can be stored in a relatively small space and in which the split keyboard pieces can be adjustably positioned.

Background of the Invention

Split keyboards, in which a standard keyboard is divided into multiple cooperating sections, are known and are desirable for numerous reasons. Such keyboards allow the cooperating sections or elements to be adjustably positioned with respect to each other, so that a user can customize the relative positions of the keyboard sections. Such keyboards also allow a keyboard to be reduced in size for storage in a relatively small area without compromising the size of the keys.

U.S. Patent 5,424,728 to Goldstein discloses a split keyboard for a computer terminal having mutually detachable and/or pivotable keyboard sections, each of which is provided with a subset of keys. The keyboard is designed to improve user comfort, and to this end the keyboard sections are coupled together by a joint which allows angular adjustment in three different axes. While the single pivot point in the split keyboard disclosed by Goldstein allows a wide range of angular adjustment, the single pivot point has the disadvantage of reduced stability.

It would be desirable for a split keyboard to allow multiple keyboard segments to be adjustably arranged to maximize user comfort, minimize storage space without compromising key size, and to provide stability.

Summary of the Invention

The present invention overcomes the above-described problems, and provides additional advantages, by providing for a split keyboard which includes multiple keyboard elements, each having a subset of keys, and a connection means for pivotally connecting the keyboard elements. The invention also includes a keyboard base element having one or more slots for receiving at least one connection pin connected

-2-

to one of the keyboard elements or to the connection means to achieve one or more
slidable connections. In the keyboard according to the present invention, the relative
positions of the keyboard elements are adjustable by pivoting the keyboard elements
about the connection means while sliding the at least one connection pin along the first
5 slot.

Thus, the present invention provides for a keyboard which includes adjustable
keyboard elements to maximize user comfort and minimize storage space without
compromising key size. As a result of using a keyboard base element in combination
with the split keyboard elements, the keyboard of the present invention offers improved
10 stability and durability over conventional keyboards.

Brief Description of the Drawings

A more complete understanding of the present invention can be obtained upon
reading the following Detailed Description of the Preferred Embodiments, in
15 conjunction with the accompanying drawings, in which like reference indicia are used
to designate like elements, and in which:

FIG. 1 is an overview diagram of a split keyboard according to an embodiment
of the present invention in a closed position;

FIG. 2 is an overview diagram of the split keyboard of FIG. 1 in a partially
20 open position;

FIG. 2a is an overview diagram of an alternate embodiment of the present
invention in a partially open position;

FIG. 3 is an overview diagram of the split keyboard of FIG. 1 in a fully-opened
position;

25 FIG. 4a is a diagram of showing the assembly of the split keyboard of FIG. 1;

FIGS. 4b-c are cross-sectional diagrams of the connector means of the split
keyboard of FIG. 1;

FIG. 4d is a cross-sectional diagram of the connector pins of the split keyboard
of FIG. 1; and

30 FIGS. 4e-f are cross-sectional diagrams of a retaining means usable in the split
keyboard of FIG. 1.

Detailed Description of the Preferred Embodiments

FIG. 1 shows an overview of a split keyboard 10 according to the present invention. The keyboard is shown in a fully-closed position, the dimensions of which can be suitably selected to allow the keyboard to be stored within a relatively small area, such as in a portable laptop computer. The keyboard 10 is shown to include left and right keyboard elements 12 and 14, respectively. It will be appreciated that while the keyboard of FIG. 1b includes only two elements, the principles of the present invention can easily be applied to keyboards having more than two elements. The left and right keyboard elements 12 and 14 are connected by a connection means 16.

Connection means 16 provides a pivotable connection between the keyboard elements 12 and 14, and will be described in more detail later. The keyboard elements 12 and 14, and the connection means 16, can cooperate with a keyboard base piece 18. The keyboard base piece 18 in this embodiment includes slots 20, 22, and 24 which are associated with the left keyboard element 12, the right keyboard element 14, and the connection means 16, respectively. The slots 20, 22, and 24 receive connector pins 20a, 22a, and 24a associated with the keyboard elements 12 and 14, and the connection means 16, respectively. The connector pins cooperate with the slots such that a slidable connection is established between the keyboard elements, connection means, and the keyboard base piece. The slots 12 and 14 are shown as curved, but could be made to be substantially straight or have an alternative shape. Further, the slots 20 and 22 could be replaced by a single slot 20', as illustrated in FIG. 2a. Also, while the split keyboard of FIG. 1 includes three separate connections to the base piece for increased stability, fewer or greater connections may be provided.

FIG. 2 shows the split keyboard of FIG. 1 in a partially opened position. As can be seen, in this partially-opened position the left and right keyboard sections 12 and 14 have been angularly displaced from the closed position shown in FIG. 1. This position is possible because connector pins 20a, 22a, and 24a slide within their associated slots 20, 22, and 24. Specifically, to open the split keyboard from the closed position of shown in FIG. 1, the left and right keyboard pieces are angularly displaced (with pins 20a and 22a sliding along slots 20 and 22) while at substantially the same time the connection means 16 is vertically displaced (with pin 24a sliding

along slot 24).

FIG. 3 shows the split keyboard in a fully-opened position. In this position, the left and right keyboard sections are at their maximum level of angular displacement from the closed position of FIG. 1. As shown in FIG. 3, the connector pins 20a and 22a are at the outside-most positions within slots 20 and 22 (that is, each pin is at the end of its associated slot), respectively, and connector pin 24a is at the vertical-most position within slot 24. It should be appreciated that retaining means other than the end of the slots 20, 22 and 24 can be provided to define the fully-opened split keyboard position. For example, the keyboard sections 12 and 14 can be shaped such that they cooperate to retain the sections in one or more positions of angular displacement. Further, as will be described in more detail below, positioning means can be provided within one or more of the slots 20, 22, and 24 to define various positions of angular displacement between the left and right keyboard sections 12 and 14.

FIG. 4a shows the assembly of the split keyboard of FIG. 1. As shown, left and right keyboard elements 12 and 14 are connected by connecting means 16. This assembly of keyboard elements is slidably connected to a first base plate 18a by connecting connector pins 20a, 22a, and 24a to the left and right keyboard elements 12 and 14, and connection means 16, respectively, through slots 20, 22 and 24 which are located in first base plate 18a. A second base plate 18b is removably attached to first base plate 18a to form the keyboard base element 18. The second base plate 18b is removable to facilitate access to the connector pins 20a, 22a, and 24a. It will be appreciated that the second base plate 18b can be omitted.

FIGS. 4b-c show a cross-sectional diagram of the connection means 16, which includes a connector element 30 which is generally cylindrical and includes hollow openings in each end to receive connection pins. One of the ends of the connector element 30 has a flange 32. The hollow opening of the flanged end of the connector element receives connector pin 24a through slot 24 of first base plate 18a. Connector element 30 fits through appropriately-shaped gaps in the left and right keyboard elements 12 and 14, and is secured in the gaps by means of a rotator connector pin 34. The left and right keyboard elements 12 and 14 are maintained in a rotatable relationship by and between the flange 32 and rotator connector pin 34. The rotator

-5-

connector pin 34 and connector pin 24 can be threaded and attached to the connector element 30 by screwing the pins into the hollow openings of the connector element.

FIG. 4d shows a cross-sectional view of an exemplary connection of the left keyboard section 12 and keyboard base element 18. As shown, connector pin 20a, which can be threaded, is inserted through slot 20 in the first base plate 18a, and is screwed into an opening in the left keyboard 12 to provide a slidable connection between the left keyboard section 12 and the keyboard base element 18. It will be appreciated that a similar connection can be used to connect the right keyboard element. Connection can also be achieved by means other than threaded connector pins.

FIGS. 4e-f show a cross-sectional view of an exemplary retaining means which can be provided in each slot of the keyboard base element 18 to retain the split keyboard elements in one or more positions. As shown, a connector pin which is connected to a keyboard section (not shown) or to the connector means 16 through one of the slots in the first base plate 18a. On the second base plate 18b, there is provided one or more bumps such as bump 38, which are appropriately positioned within a path defined by the slots in the first base plate 18a. In this example, the bump 38 is located so as to retain the connector pin in a position at the end of its associated slot, as the connector pin is retained between the end of the slot and the bump 38. To allow the connector pin to be moved into and out of this position, bump slots 39 are provided on opposite sides of the bump 38. The bump slots 39 allow the bump 38 to be downwardly displaced while the connector pin is moved into and out of the retained position defined by the bump 38 and the end of the slot. It will be appreciated that rather than bumps such as bump 38, depressions can be provided on the second base plate 18b to retain the connector pin (and thus the keyboard elements) in one or more positions. Further, the slots in the first base plate 18a can be notched to retain the connector pin (and thus the keyboard elements). Many other suitable retaining means can be used.

While the foregoing description includes numerous details and specificities, it is to be understood that these are for purposes of explanation only. Many modifications will be readily apparent to those of ordinary skill in the art which are

-6-

clearly within the spirit and scope of the invention, as defined by the following claims and their legal equivalents.

-7-

WHAT IS CLAIMED IS:

1. A keyboard, comprising:
 - a first keyboard element including a first set of keys and a first top;
 - 5 a second keyboard element including a second set of keys and a second top;
 - connection means for pivotally connecting the first and second keyboard elements at at least one connection point; and
 - a keyboard base element having a first slot for receiving at least one connection pin connected to the first or second keyboard element to achieve a first slidable
 - 10 connection, such that the relative positions of the first and second keyboard elements are adjustable by pivoting the first and second keyboard elements about the connection means while sliding the at least one connection pin along the first slot;
 - wherein the first and second keyboard elements pivot from a closed storage position to an open position;
 - 15 wherein the first top and the second top are substantially parallel to one another when the first and second keyboard elements are in a closed storage position; and
 - wherein the closed storage position uses less storage space than the open position.
- 20 2. The keyboard of claim 1, wherein the keyboard base element further comprises a second slot for receiving at least one second connection pin connected to the other of the first or second keyboard element to achieve a second slidable connection.
- 25 3. The keyboard of claim 1, wherein the first slot further receives at least one second connection pin connected to the other of the first or second keyboard element.
4. The keyboard of claim 1, wherein the first slot includes means for maintaining at least one position of the at least one connection pin.
- 30 5. The keyboard of claim 1, wherein the first slot is curved.

-8-

6. The keyboard of claim 1, wherein the keyboard base element further includes a connection means slot for slidably engaging the keyboard base element with the connection means.

5 7. The keyboard element of claim 2, wherein the first and second slots each include means for maintaining at least one position of the at least one first and second connection pins.

8. The keyboard of claim 2, wherein the first and second slots are curved.
10

9. The keyboard of claim 2, wherein the keyboard base element further includes a connection means slot for slidably engaging the keyboard base element with the connection means.

15 10. The keyboard of claim 1, wherein the keyboard base element includes means for accessing the at least one connection pin.

11. A method for forming a keyboard, comprising the steps of:
producing at least two keyboard elements rotatably connected to each other by
20 a connector means, each keyboard element including a set of keys and a respective top;
forming a base element having at least one connector pin receiving slot;
connecting at least one first connector pin between at least one of the at least two keyboard elements and the at least one receiving slot such that at least one of the keyboard elements is slidably connected to the base element;

25 wherein the at least two keyboard elements pivot from a closed storage position to an open position;

wherein the respective tops of the at least two keyboard elements are substantially parallel to one another when the first and second keyboard elements are in a closed storage position; and

30 wherein the closed storage position uses less storage space than the open position.

-9-

12. The method of claim 11, wherein the base element has a connector means receiving slot for receiving a connector means pin, and the step of connecting further includes connecting the connector means pin between the connector means and the connector means receiving slot.

5

13. The keyboard of claim 11, wherein the first slot includes means for maintaining at least one position of the at least one connector pin.

14. The keyboard of claim 11, wherein the first slot is curved.

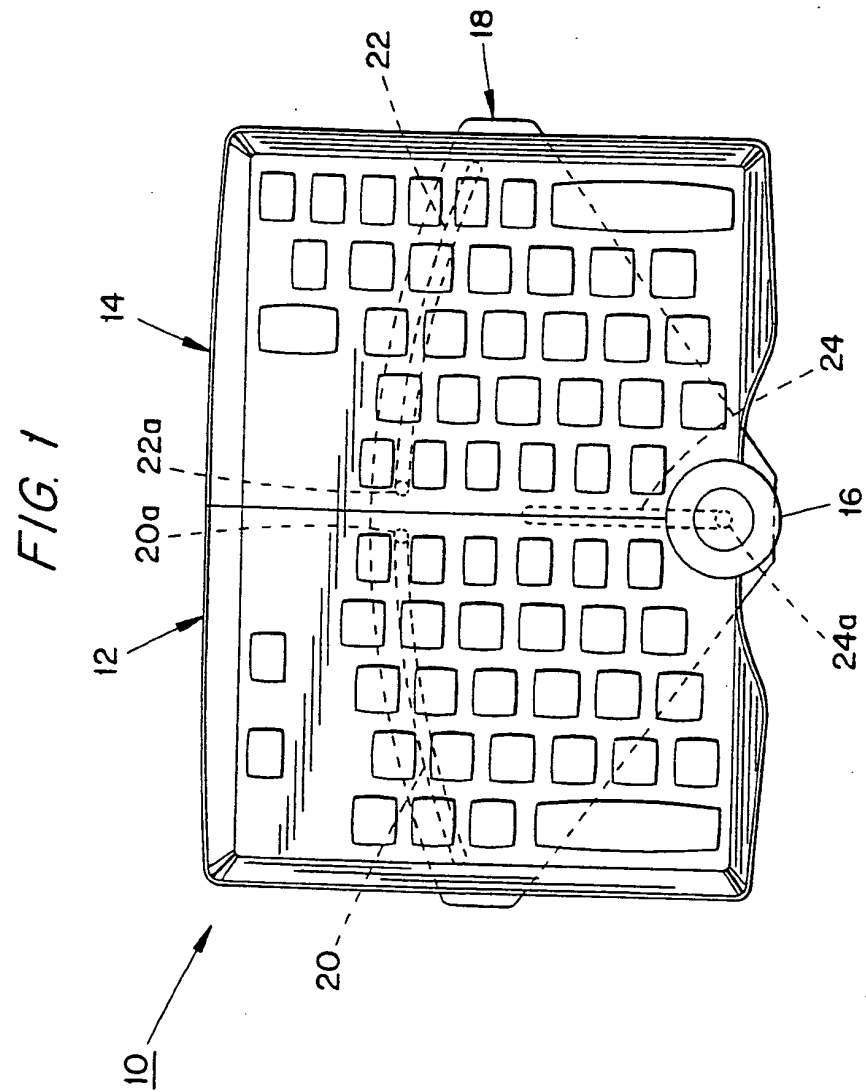


FIG. 2

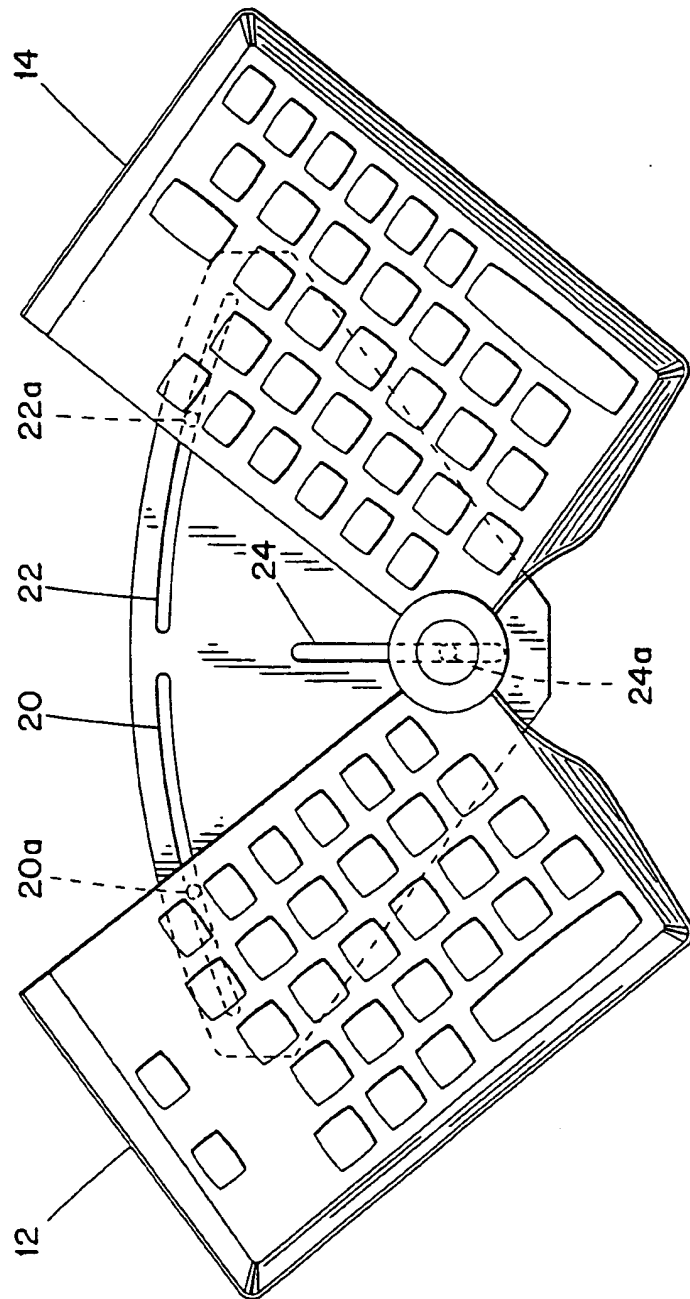


FIG. 2A

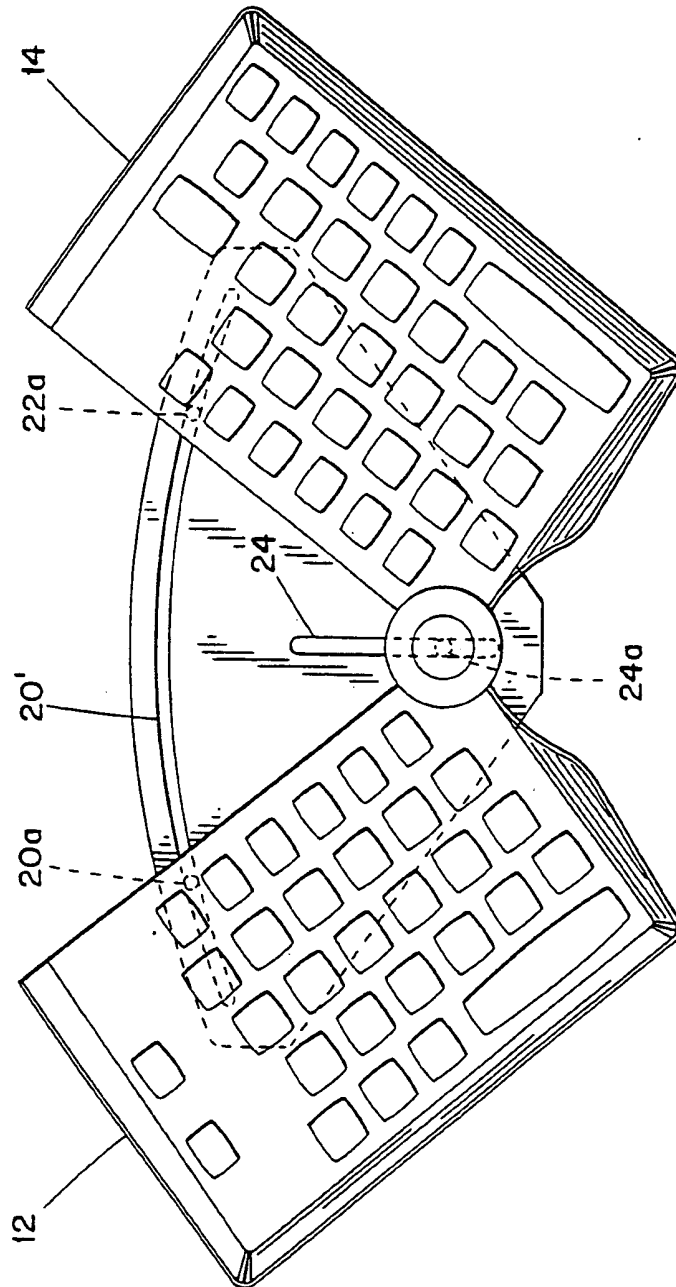
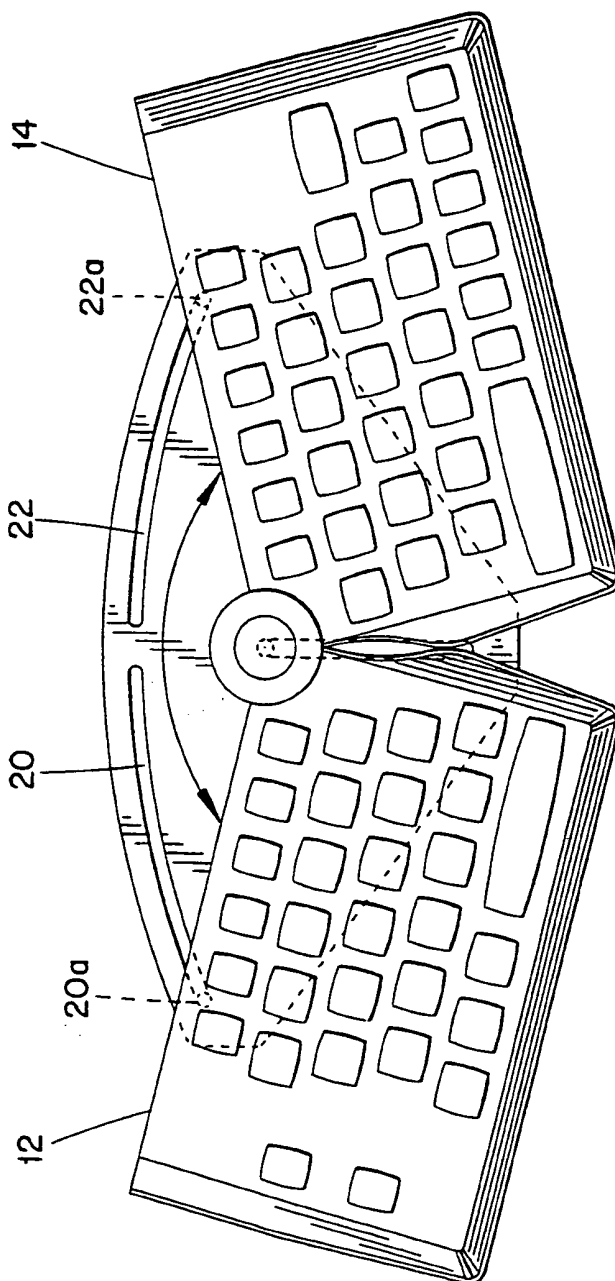


FIG. 3



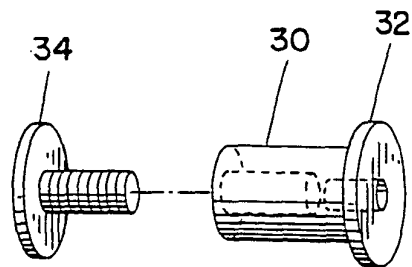
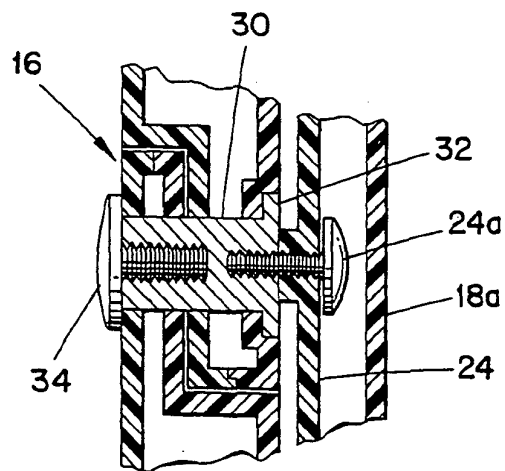
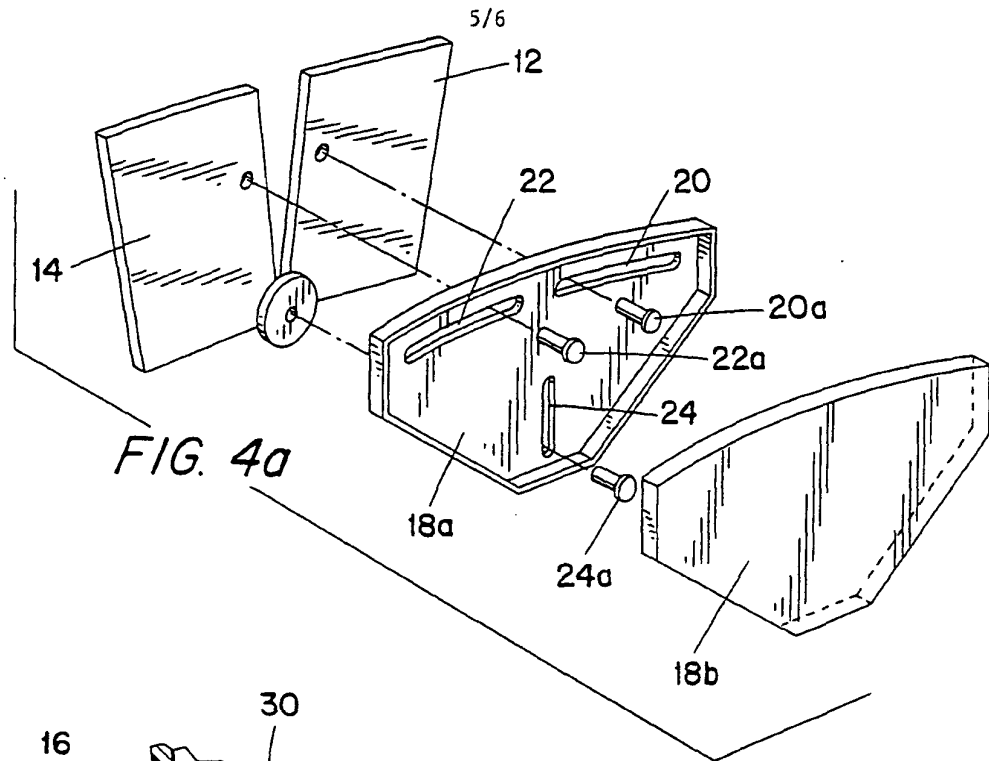


FIG. 4c

6/6

FIG. 4d

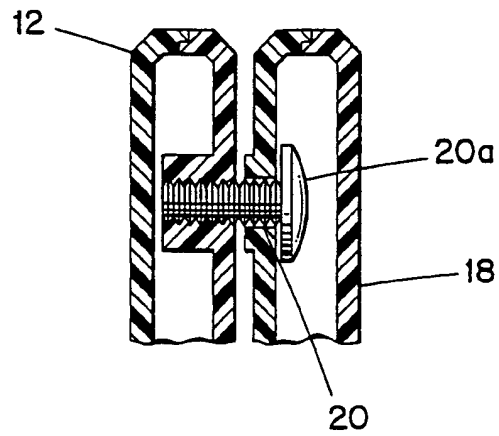


FIG. 4e

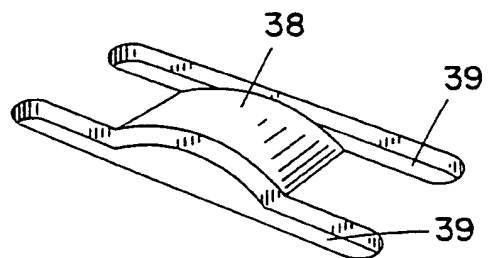
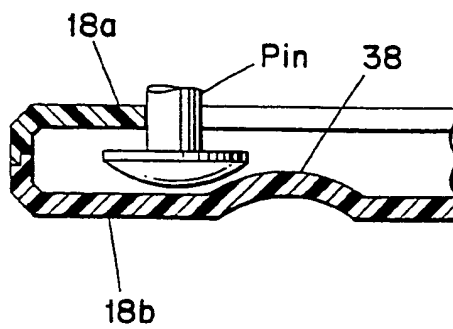


FIG. 4f

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 98/05389

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06F3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F H01H B41J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 189 (P-1521), 13 April 1993 & JP 04 340122 A (KAZUO KAWASAKI), 26 November 1992, see abstract	1,2,5,8, 10,11,14
Y	& JP 04 340 122 A (KAZUO KAWASAKI) see figures 1-9	4,6,7,9, 12,13
Y	EP 0 489 491 A (IBM) 10 June 1992 see abstract see column 6, line 56 - column 8, line 19; figures 2-4 see column 8, line 56 - column 9, line 49 --- -/--	6,9,12



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"S" document member of the same patent family

Date of the actual completion of the international search

26 May 1998

Date of mailing of the international search report

05/06/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Bravo, P

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/US 98/05389

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 596 480 A (MANSER BRIAN E ET AL) 21 January 1997 see abstract see column 3, line 58 - column 4, line 31; figures 3-5	1,2,5,7, 8,11,14
P,Y	US 5 651 622 A (KIM TAE-YONG) 29 July 1997 see abstract see column 2, line 55 - column 4, line 32; figures 2,3	4,7,13

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No

PCT/US 98/05389

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0489491 A	10-06-1992	US 5198991 A AT 154453 T CA 2051195 A,C CN 1061857 A,B DE 69126510 D FI 915586 A JP 1993564 C JP 5165548 A JP 7027430 B KR 9406797 B MX 174418 B PT 99635 A US 5267127 A	30-03-1993 15-06-1997 31-05-1992 10-06-1992 17-07-1997 31-05-1992 22-11-1995 02-07-1993 29-03-1995 27-07-1994 13-05-1994 30-11-1993 30-11-1993
US 5596480 A	21-01-1997	US 5646817 A	08-07-1997
US 5651622 A	29-07-1997	NONE	